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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/823,989	04/14/2004	Chentsau Ying	7975/ETCH/METAL/JB1	4996

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08/12/2005

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EXAMINER

AHMED, SHAMIM

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 08/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/823,989	Applicant(s) YING ET AL.	
	Examiner Shamim Ahmed	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 April 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Claim Objections

1. Claims 5 and 18 are objected to because of the following informalities: Both of the claims recite trifluoromethane as "CHF₄", which should be "CHF₃". Appropriate correction is required.
2. Claim 25 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 25 is same as the claim 10.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-9, 12 and 17-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Sattayapiwat Tang et al (US 2004/0192059).

Sattayapiwat Tang et al disclose a process of etching titanium-containing metal layer, wherein a patterned masking layer of photoresist (12) is provided over the metal layer

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and exposing the metal layer to a gas mixture of fluorine-containing gas and a chlorine-containing gas into a plasma chamber (see paragraph 0025).

5. Claims 1-9,12,17-22 and 29-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Ionov et al (6,013,582).

Ionov et al disclose a process of etching multilayer stack including the steps of providing a patterned mask layer of photoresist (321) over at least one metal layer (317 and 318) and exposing the metal layer to a plasma, wherein the plasma is generated with the mixture of chlorine-containing gas and fluorine containing gas (col.5, lines 11-19 and col.11, lines 19-33).

Ionov et al teach that the fluorine containing gas is CHF_3 and chlorine-containing gas is chlorine (Cl_2) (col.11, lines 35-38).

As to claims 21-22, Ionov et al teach the claimed power, bias power, substrate temperature and the chamber pressure (col.11, lines 34-37).

As to claim 29-30, Ionov et al teach that a trench is formed through the metal layers and the trench may extends into a dielectric layer disposed below the metal layer (col.11, lines 48-52 and figure 3C).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 10-11, 13-16 and 23-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ionov et al (6,013,582) in view of Wei et al (6,537,907).

Ionov et al disclose above in the paragraph 5 but fail to teach removing the mask utilizing oxygen plasma.

However, Wei et al teach after an etching process photoresist masking layer is removed by oxygen plasma ashing (col.3, lines 62-65).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to employ Wei et al's conventional teaching of removing the photoresist mask layer using oxygen plasma into Ionov et al's process for efficiently removing the masking layer as taught by Wei et al.

As to claims 13-15, it would have been obvious to one of ordinary skilled in the art to replace any of the claimed metal because all of them are refractory metal group as functional equivalent with each other.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Nallan et al (6,531,404) teach a plasma etching of metal-containing layer using a gas source comprising chlorine and a fluorocarbon.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shamim Ahmed
Primary Examiner
Art Unit 1765